



Working with high-definition video

With its promise of bigger and better pictures, high-definition video is every amateur film-maker's dream come true. Ben Pitt shows you exactly what you need to get started

You've probably heard of high definition, or HD as it's commonly known. In *Labs*, *Shopper* February 2006 we reviewed 11 LCD TVs that declare themselves to be HD Ready, and in *What's New*, *Shopper* January 2006 we looked at Sony's HDR-HC1, the first high-definition video camera aimed at home users.

With resolutions of up to five times that of the video we're used to seeing, HD certainly looks impressive, and it's probably only a matter of time before it's standard across all video-related devices. So is it time for home-movie makers to embrace this exciting new technology? There are a few things to consider before you take the plunge.

WHAT IS HD?

High definition introduces lots of new jargon. For example, HD is a general term for any video that runs at a higher resolution than the current PAL and NTSC standards, but HDV is the name of a specific video camera format developed by Sony, JVC, Canon and Sharp. There are lots of other acronyms and expressions, too. Use the jargon buster opposite to find out what they mean.

While HD is a blanket term for any high-resolution video, in practice it usually refers to a limited set of specifications that are already in common use in the USA. For instance, 720p is the shortened name for digital video that consists of 1,280x720-pixel images. The 'p' stands for progressive scan, meaning each frame comprises the entire 1,280x720-pixel image.

The other common resolution is 1080i, which runs at 1,920x1,080 pixels. The 'i' stands for interlaced, which means each frame alternates between showing only the odd or the even lines. This halves the amount of recorded data for each frame (or field, as an interlaced half-frame is known). However, monitors, LCD TVs, plasma screens and projectors use progressive scan, so interlaced footage must be de-interlaced using digital processing before it can be displayed. This leads to a slight loss of clarity, especially in fast-moving images.

The third, less-common resolution is 1080p, which comprises 1,920x1,080-pixel progressively scanned frames and gives hugely detailed images with no de-interlacing artefacts. The downside is the huge amount of data required to describe each frame, which leads us to the subject of frame rates.

There are no regional variations of HD resolutions for different parts of the world like

those PAL and NTSC gave us, but the frame rates for PAL (25 frames per second, or fps) and NTSC (30fps) look likely to persist in the European and US markets respectively. Things get even more complicated when we add the issue of progressive scan versus interlaced. Some American TV networks currently broadcast HD content at 720p running at 60Hz, while others broadcast at 1080i at 60Hz (as in 60 fields per second, which equates to 30 full frames per second). Broadcasting 1080p at 60Hz would require double the bandwidth of either of these, so it simply isn't practical under current systems. However, 1080p is practical at lower frame rates: 1080p at 30Hz uses the same bandwidth as 1080i at 60Hz, and although motion isn't as smooth, it's smoother than film, which runs at just 24fps. In fact, some people favour 1080p at 24Hz for its film-like qualities.

However, even at lower frame rates, 1080p has the odds stacked against it. TVs must support 1080i and 720p in order to be called HD Ready, but not 1080p. What's more, it's not included in the specifications for the HDV camera format.

It's impossible to say when these specifications will settle down to a single HD format, but for now 720p and 1080i running at 50Hz seem to be the common standards for broadcasts, TVs, video cameras and next-generation DVDs in Europe.

SHOOTING IN HD

Let's look at the options for filming your own HD movies. Unless you have tens of thousands of pounds to spend, you can consider only HDV.



Films such as *Terminator 2* are available on DVD-ROM in WMV HD format in the US and Canada. You can download sample clips from www.wmvhd.com



HDV cameras record in either 720p or 1080i (although, so far, cameras capture only one or the other) using a variant of the MPEG2 format called MPEG2 TS to fit HD footage on standard MiniDV cassettes (MPEG2 compresses video much more efficiently than the DV AVI format). This means HDV cameras can double as standard-definition (SD) MiniDV cameras.

Sony's HDR-FX1 was the first camera to bear the HDV logo, and captures 1080i at 50Hz (or 60Hz for the US version), using non-square pixels to record a widescreen picture with a 1,440x1,080 resolution. It has three CCDs and offers extensive manual control, and as such its price of £2,400 has caused delight among amateur film-makers. If the FX1 isn't good enough, Sony also has the HVR-Z1 for around £3,600, while JVC's £4,000 GY-HD100E or Canon's £6,000 XL-H1 could be fun if you're spending someone else's money.

For most, Sony's HDR-HC1 might be a better bet. At around £1,055, it's just about affordable for keen home-movie-makers. Although its appearance and limited manual controls separate it from Sony's FX1, it captures the same 1080i 50Hz video, and its output quality is extremely high. You can read our full review on page 166.

For most people, there are essentially two options: buy the Sony HDR-HC1 or wait for a cheaper model to come along. We anticipate that 2006 will be the year in which the leading HDV camera manufacturers start to chase the home market with increased vigour. However, it might take a while before prices hit the £500 mark. It's also worth bearing in mind that the Sony HC1's SD performance compares well with that of other, similarly priced DV cameras, so you're not being charged a premium for its HDV capability.

EDITING

HDV cameras may be thin on the ground, but editing software has been a little more forthcoming. The HDV format's evolution from DV means that it too supports digital transfers over FireWire. Capturing from an HDV camera to a PC is a simple matter of connecting the two with a FireWire cable and hitting record in compatible editing software.

On page 200 you can read our Labs test of medium- to high-end video-editing software, nearly all of which supports HDV cameras. This software is expensive, but already various cheaper packages support HDV too, including the editor bundled with Nero 7. But for HDV editing on a budget there's currently only one sensible option, and that's Sony Vegas Movie Studio Platinum 6. This cut-down version of Vegas 6 supports capture from HDV cameras and, crucially, includes a video codec called Cineform, which acts as an intermediate video format for improved preview performance during editing.

This is useful because although the MPEG2 TS format is great for keeping file sizes low, it's not easy to manipulate. MPEG2-compressed frames contain only the parts of a picture that differ from the previous frame. This means that to reconstruct a frame for playback, the player must know the contents of a large number of frames – MPEG2 TS records in

groups of 15 frames (known as Group Of Pictures or GOP). This isn't a huge problem for linear playback, but when you start to chop video into bits and play them non-sequentially, it starts to get very complicated and previews slow down to a crawl. By converting to an alternative format with a shorter GOP (Cineform has a two-GOP structure), the file sizes increase but so does the ease with which you can manipulate the video.

Even so, HD editing requires a powerful computer. We wouldn't recommend trying it on anything slower than a Pentium 4 3GHz or Athlon 64 3200+ PC. Having at least 1GB of RAM is a good idea as well.

DISTRIBUTION

Once you have filmed and edited your HD video, what happens next? Unfortunately, this part of the production chain has yet to materialise in full. HD TVs are already available, but the high-definition successors to the DVD Video disc are running late, thanks to wrangles concerning copy protection and failed attempts to avoid a good old-fashioned format war.

HD-DVD and Blu-ray Disc are both familiar-looking 12cm optical discs. Blu-ray Disc (or BD for short) has a 25GB capacity for single-layer discs and a 54Mbit/s bandwidth. HD-DVD comes in at 15GB and a 36.55Mbit/s bandwidth, but has the advantage of a manufacturing process that's closer to that of existing DVD technology, which should bring lower costs faster. Both media offer enough storage and bandwidth for many hours of HD video, especially as both will support VC-1 (a form of WMV) and AVC (otherwise known as H.264 or MPEG4 Part 10), which compress video even more efficiently than MPEG2.

This format war is really more about corporate politics than technical aptitude, and it now seems inevitable that both will coexist, however awkwardly, for some time. This probably means that most people will be put off buying either type of player or PC drive, which leaves those creating HD video content – particularly those who are on a budget – in a precarious situation.

However, home video producers may have quite a wait before either format is available to them. While set-top players and disc burners are expected in the next few months, there is currently no news of affordable HD authoring software. Sonic has announced the imminent launch of BD and HD-DVD modules for Scenarist, the industry-standard application for professional DVD

authoring. However, its director for European operations, Richard Linecar, couldn't say when an HD authoring product equivalent to DVDit would be available.

In the meantime, one option is to render HD productions to standard-definition DVD Video but keep the high-definition video files for when HD-DVD or BD authoring becomes available. Alternatively, you could render your video in WMV HD format, which will play on PCs running Windows XP with Windows Media Player 9, although Microsoft recommends a 3GHz processor for

smooth playback. WMV HD is an incredibly efficient format, so you will be able to fit up to three hours of HD video on a dual-layer DVD.



▲ Sony's HDR-HC1 is the first HDV camera to be within financial reach of home users

TAKING THE PLUNGE

With various issues still to be ironed out, it may seem premature to start buying new equipment. However, while the future of HD distribution is uncertain, it seems likely that HDV cameras are here to stay, for a few years at least. Sony's HDR-HC1 probably won't be the most affordable HDV camera for long, but it might be the best sub-£1,100 HDV camera for quite some time. Start shooting on this camera, and when you come to invest in HD authoring software you'll have a catalogue of HD footage to work with.

JARGON BUSTER

HD	High definition – video that runs at a higher resolution than standard-definition (SD) video.
SD	Standard definition, the general term for the PAL and NTSC video specifications in general use today.
HDV	High-Definition Video, a video camera format that records HD to standard MiniDV tapes in MPEG2 TS format. Resolutions are limited to 720p at 60Hz, 50Hz, 30Hz and 25Hz, and 1080i at 60Hz and 50Hz.
ProHD	An extension of the HDV format, which adds 720p at 24fps. JVC's GY-HD100E camera uses this.
Progressive scan	Video in which each frame is a complete, full-resolution image.
Interlaced	Video in which each alternate frame shows the odd and then the even lines of an image.
De-interlacing	The process of turning interlaced video into progressive scan, which is necessary before it can be shown on an LCD, plasma screen or projector. This causes some degradation of picture quality.
MiniDV	The cassette format used by standard-definition consumer DV cameras, and now also HDV cameras.
Blu-ray Disc	A potential successor to DVD with a 25GB capacity per layer.
HD-DVD	Another potential successor to DVD, with a 15GB capacity per layer.
Codec	Short for compressor-decompressor, an algorithm that compresses raw video or audio data into smaller files for easier storage or transmission, and decompresses it for playback. Codecs used for HD include MPEG2, VC-1 and AVC.
720p	Progressively scanned video with a 720-pixel vertical and (invariably) 1,280-pixel horizontal resolution.
1080i	Interlaced video with a 1,080-pixel vertical and 1,920- or 1,440-pixel horizontal resolution.
1080p	Progressively scanned video with a 1,080-pixel vertical and 1,920- or 1,440-pixel horizontal resolution.



▲ Vegas Movie Studio Platinum offers excellent support for HDV for the reasonable sum of £99